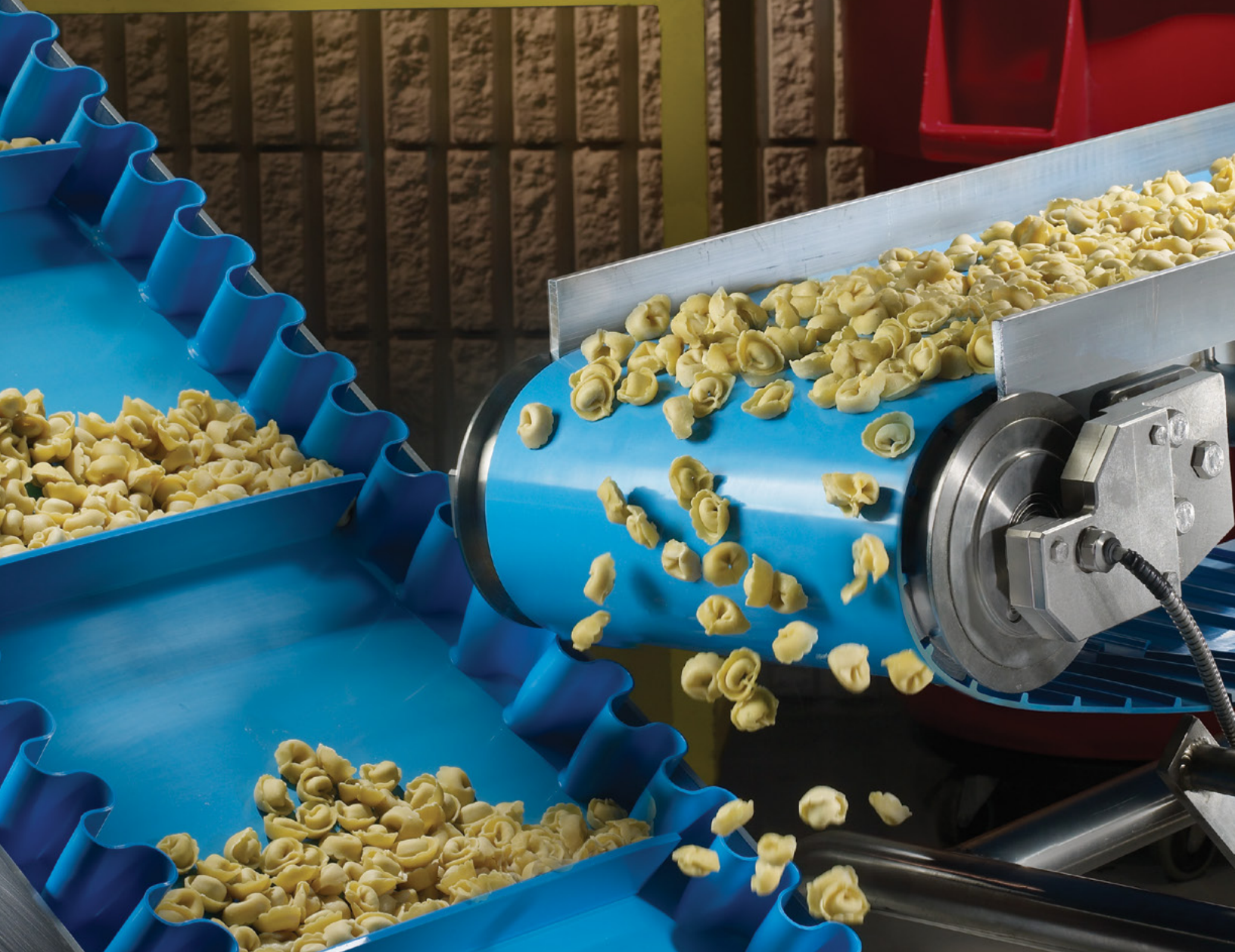




# TPU BELTS

THERMOPLASTIC POLYURETHANE



## NOVITool® AERO™ PORTABLE SPlice PRESS

WELDING GUIDELINES





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## INTRODUCTION

It is important that the FLEXCO Novitool® Aero™ Splice Press Safety and Operating manual provided with the press be followed. The guidelines here are not meant to be a substitute for the FLEXCO handbook but rather to complement it. Several comments are in order:

The purpose of the heat profile setting recommendations found in this guideline is to ensure a urethane belt phase transition from solid to liquid during the weld process. The settings to achieve this phase transition vary due to the individual press, the belt material and the environment. Prior to attempting the actual weld, it is necessary to confirm that this temperature needed to achieve this phase transition is met by conducting a test weld. To conduct this test, a thermocouple must be embedded in the belt material (for toothed belts, the thermocouple should be placed in the silicone pad's tooth trough). If the thermocouple doesn't register the minimum actual belt temperature called out for that pitch, it is likely that the weld will be compromised. Minimum actual belt temperatures and dwell times can be found directly below the recommended settings table. If the minimum temperature is not achieved, it will be necessary to contact Flexco to determine the root cause.

- Gates TPU can confirm weld integrity through tensile and accelerated life cycle testing. For tensile testing, submitted samples must be at least 3" wide with 12" of belt length on each side of the weld. For life testing, samples must be a welded belt 24" wide x 50" long.

Flexco recommends doing a warm up weld prior to performing the actual finished weld, particularly in cold environments.

Note that a platen press weld causes the welded area to shrink slightly. This shrinkage may cause the belt edges to lift slightly. Be sure that this edge lift will not affect the belt's performance in your application.



## CAUTIONS

### OVERALL SAFETY RULES

To Avoid Severe Personal Injury or Property Damage, Read Carefully and Understand the Following Safety Precautions.

#### **DANGER**

Terminate electrical hazards by removing power cord from wall receptacle or machine base inlet.

#### **WARNING**

Terminate pressure related hazards by pressing the red pressure relief button.

#### **CAUTION**

Avoid temperature related hazards by handling press components and belt once safely cooled.

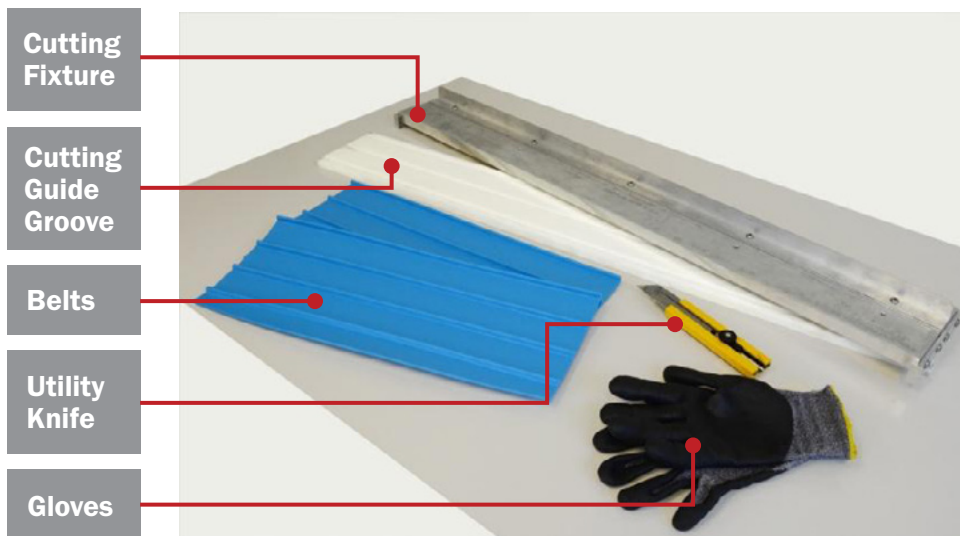


## BELT PREPARATION – PC10 AND PC20

### “SPLIT TOOTH” CUT DIRECTIONS

The split tooth technique is recommended for two reasons:

1. The greater the bonded surface area, the greater the weld strength. When compared to base belt thickness, bonding in the tooth area increases the weld surface area by 240% for the PC10 and 380% for the PC20.
2. Running in an untensioned state, most of the belt flex takes place in the flat area between the teeth rather than at the tooth itself. The weld should always be located in the area experiencing the least amount of belt flex.



Straight Cut Equipment

To prepare belt ends for a straight cut the following items are needed:

- Cutting Fixture
- Cutting Guide Groove
- Utility Knife
- Safety Gloves
- Belts



## CAUTION, WEAR PROTECTIVE GLOVES

### 1. Determine belt length.

- A. Mark both ends of belt, marking must be on the center of the tooth.

### 2. Cut the belt.

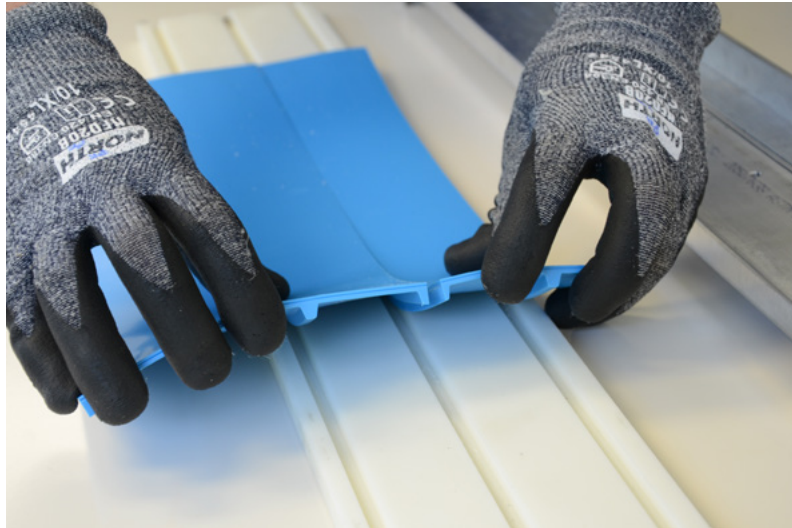
- A. Insert one end of the belt into the cutting fixture. (Must have ~ 3 teeth of extra material on the scrap side that will be cut off. This will keep the belt in place while cutting.) Ensure that the belt is fully engaged in the cutting guide groove.
- B. Place top of the cutting fixture on the top of the belt, apply pressure on it with one hand.
- C. Using your other hand, make several straight scoring cuts with the utility knife. (Do NOT try to cut the belt in one deep cut. It does not work).



Straight Cut with Utility Knife



D. You will have two split teeth. Ideally both cut halves would be equal to or slightly larger than half a tooth. Slightly oversizing creates helpful side pressure when the two halves are forced into the silicone pad. Welding two cut halves, that together make up less than a full tooth, will cause the belt to thin out in the tooth area and could compromise the weld due to lack of side pressure pushing the two halves together.



Two Split Teeth

3. Clean the prepared ends with alcohol (91% or higher) and a clean rag. Clean top and bottom surfaces at least 5" to 6" from the joint. A cleaned surface will provide a better, stronger joint.



Clean Prepared Ends



## PRESS ASSEMBLY – PC10 AND PC20

1. Place one end of the belt into the press.



Belt in Cutting Guide

2. Load the other end of the belt into the press from the opposite side.



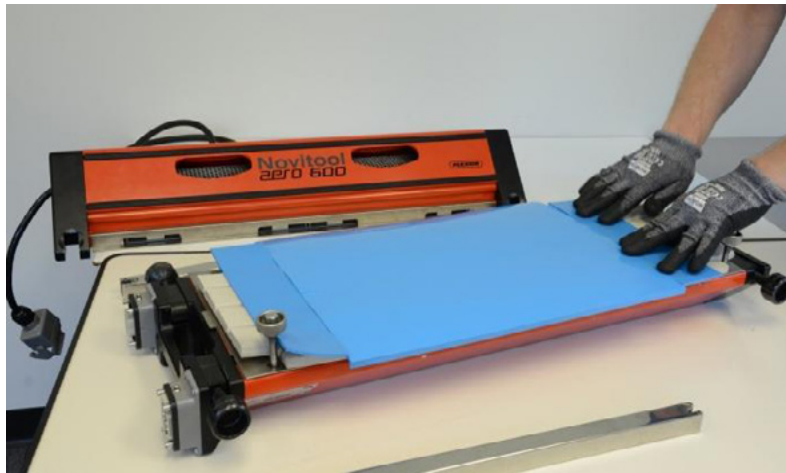
Belt Loaded in Opposite Side

3. Confirm that the mating surfaces are pressed against each other and that belt edges line up.



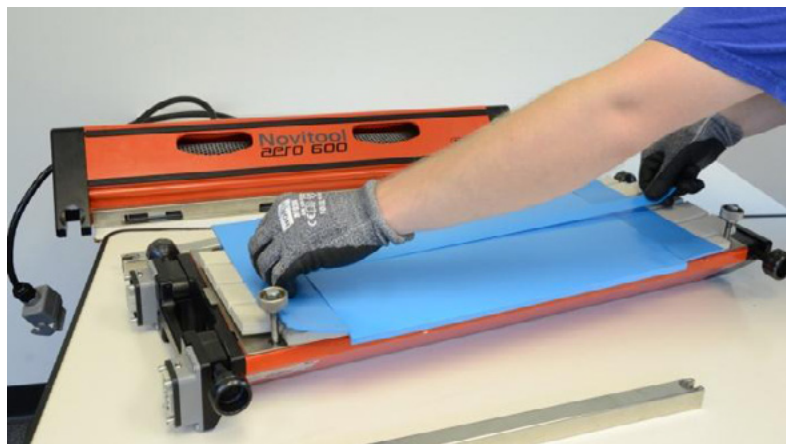
4. Fill out the balance of the platen with like-belt material and use a narrow silicone strip (approximately 1" wide and at least 0.015" thinner than the belt itself) at each outside platen end to cap the end of this like-belt material. Silicone can be substituted to fill out the press but the use of like belt material will reduce the "hourglass" effect in the weld area caused by shrinkage. Any silicone used on the tooth side must have the same tooth pattern.

- Filler strips along the belt edges serve several purposes
  - Prevent the belt from flowing out during the welding process
  - Help minimize shrinkage in the weld area
  - Balance the top and bottom platen during welding
- There can be no gaps or open areas on the platen bed



Filler Strips

5. Apply a 1.5" wide strip of blue urethane foil across the top and bottom splice (Gates TPU PN 15260, sold in 50' lengths).



Tape Positioned Over Belt



6. Place the clamping bars and tighten clamps.



Position Clamping Bars

7. It is recommended that the two belt halves are tack welded together using a soldering gun with a smooth tip (Weller PN 6160, Weller offers a cordless (battery powered) powered portable soldering iron PN BP860MP for added convenience). It is also recommended that the tape be tack welded to the belt, particularly for wider belts where handling the top press beam is more challenging.

8. Place Teflon sheet over the joint area. Be careful to keep it aligned with the welding area.



Add Teflon Sheet



9. Set the top press beam on the Teflon sheet.



Position Welder Top

10. Hand-tighten the side bolts until they stop.

- Do NOT use any tools to tighten the bolts. Tighten bolts by hand only



## WELDER OPERATION – PC10 AND PC20

### 1. To power the welder.

A. Connect cable from the top of the welder into the bottom platen and then plug it into the power cord (Voltage from 230V to 460V).

1) Powered on, the welder will be idling at ~70°F (21°C).



Powered On, Idling

### 2. Temperature control.

A. Press the first, left, button to switch to level 2 to control the bottom platen separately and it will switch back automatically to idling mode.

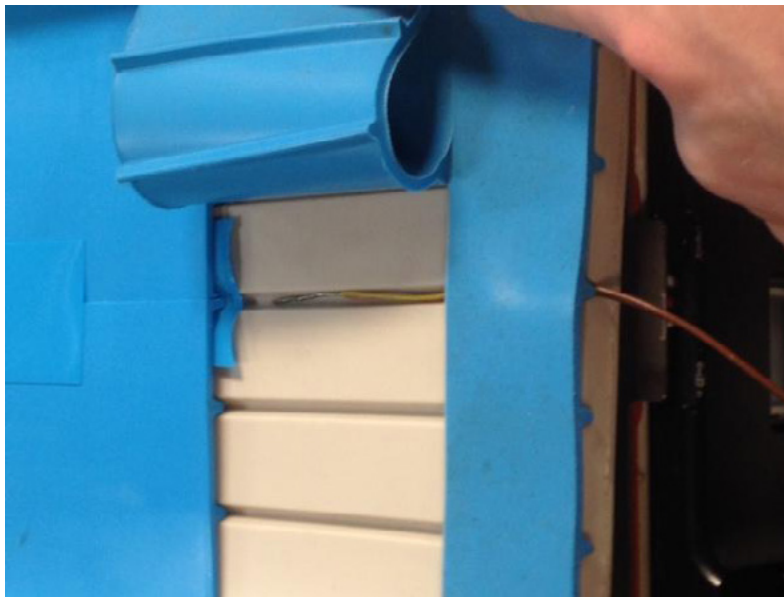


Preheat Mode



- B. Pre-dry option** – If the working environment is humid or wet, it will be necessary pre-dry the belt. Failure to do so will cause pinholes created by the steam escaping from the belt during welding. The pre-dry temperature and time must be set manually. No pressure is used in the press during the pre-dry cycle. The pre-dry setting is 200°F (93.3°C) for five to ten minutes.
- C. The actual belt temperature will vary due to the individual press, the belt material and the environment.** Prior to attempting the actual weld, it is necessary to confirm that the temperature needed to achieve this phase transition is met by conducting a test weld. To conduct this test, a thermocouple must be embedded in the belt material, preferably in the filler material, one quarter inch outside the belt edge. For PosiClean toothed belts, the thermocouple should be placed in the silicone pad's tooth trough (see photo below).

Minimum actual belt temperature and dwell time can be found in the following **Minimum Actual Belt Readings** table. If the thermocouple doesn't register this minimum actual belt temperature, it is likely that the weld will be compromised. It will be necessary to contact Flexco to determine the root cause of the problem.



Thermocouple Placement



D. The settings in the following tables are recommended as starting points only. Note that final belt temperature is influenced by the material, the environment and the Aero press itself. For use with any other manufacturer's platen press, the "Minimum Actual Belt Readings" can be followed but requires the use of a thermocouple.

## WELDING PARAMETERS

For use with the 12 mm thick silicone bottom plate

		PC10	PC20	PC20 Cold Temp
Top Platen	Degrees F (C)	365°F (185°C)	365°F (185°C)	370°F (187.8°C)
Bottom Platen	Degrees F (C)	+5%	+5%	+5%
Cycle Time	Minutes	7 1/2	7 1/2	6
Pressure	Bar	1.98	1.98	1.98
Type of Cut		Split Tooth	Split Tooth	Split Tooth
Bottom Pad (12. mm)		Silicone	Silicone	Silicone

For use with the 8 mm thick silicone bottom plate

		PC10	PC20	PC20 Cold Temp
Top Platen	Degrees F (C)	360°F (182.2°C)	360°F (182.2°C)	365°F (185°C)
Bottom Platen	Degrees F (C)	360°F (182.2°C)	360°F (182.2°C)	+5%
Cycle Time	Minutes	7 1/2	7 1/2	6
Pressure	Bar	1.98	1.98	1.98
Type of Cut		Split Tooth	Split Tooth	Split Tooth
Bottom Pad (8 mm)		Silicone	Silicone	Silicone

Minimum Actual Belt Readings (for use with other platen press types)

		PC10	PC20	PC20 Cold Temp
Temperature	Degrees F (C)	365°F (185°C)	365°F (185°C)	363°F (183.9°C)
Dwell Time	Minutes	3	3	3

3. Before starting the weld cycle, remove the clamping bars completely from the press. Push the start button twice on the top platen above the digital screen (green button) to start the cycle.

**A. All temperature control options must be complete**



Green Start Button

4. Cooling and removing the belt. Maximum temperature before opening the press is 150°F (65.5°C). When the welder completes the welding and cooling cycles:

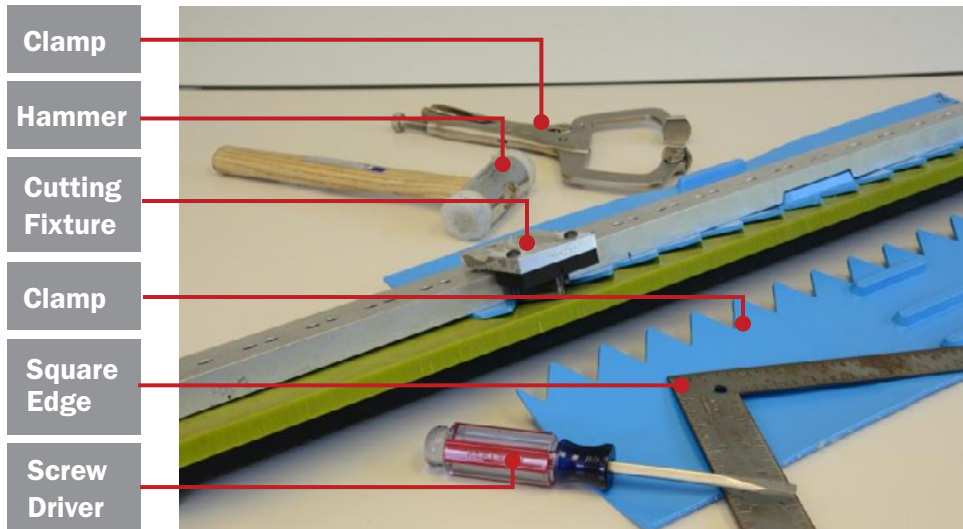
- A. Release the pressure using the RED button on the bottom next to pressure regulator digital screen.**
- B. Loosen the side bolts.**
- C. Remove the top press beam.**
- D. Check the joint weld area for good flow.**



Release Pressure Using the RED Button

5. **IMPORTANT:** Do NOT run the belt immediately. The belt requires an additional 30 to 60 minutes cooling time.

## BELT PREPARATION – CC40



Finger Punch Equipment

To prepare belt ends for a Finger Punch (chevron cut) the following items are needed:

- Cutting Fixture
- Clamps
- Nylon or Rubber Hammer
- Flat Head Screw Driver
- Square Edge

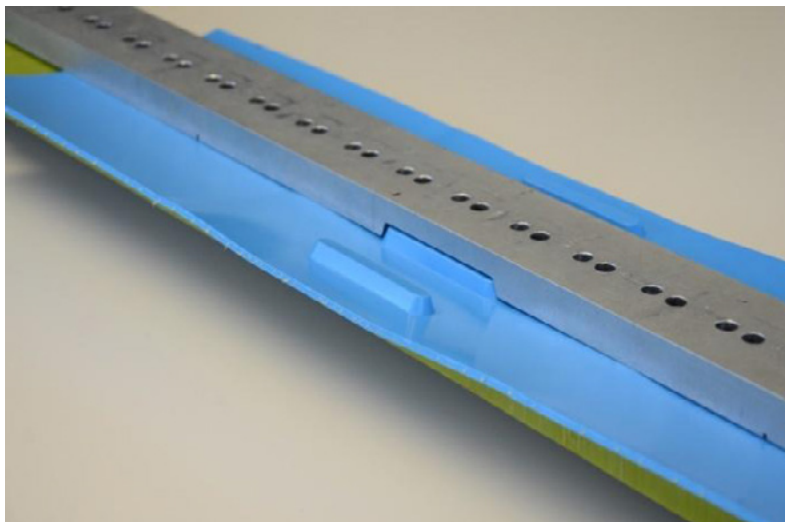
### CAUTION, WEAR PROTECTIVE GLOVES

1. Determine belt length.

Mark belt.

2. Place one end of the belt into the cutting fixture.

A. Use a square edge to align one edge. For example, if it is a left edge make sure you do the other end from the same edge and place it into the fixture the same way.





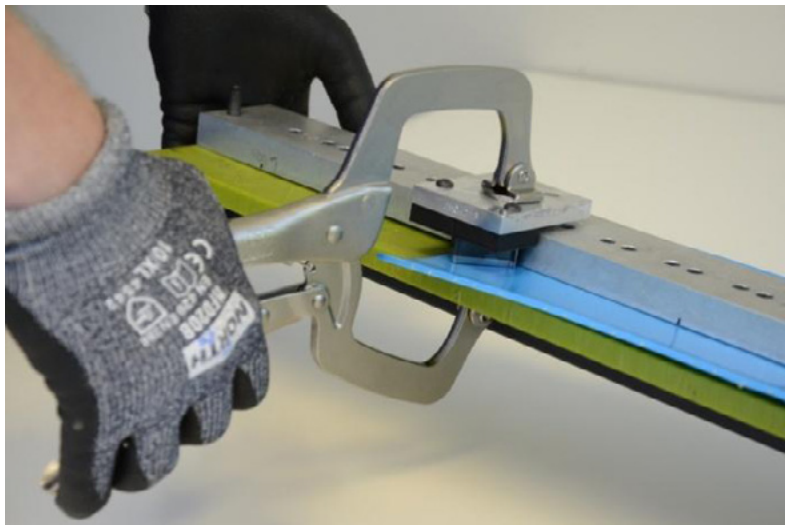


**B. Cutting fixture has an open tooth on the front side. Select one side of the edge in that tooth and make a mark on the belt or the fixture to ensure that both ends are positioned in same place.**

**C. Hand-tighten the cutting fixture bolts.**

### 3. Cutting the belt.

**A. Start at either edge of the belt. Insert the triangular blade. Use welding clamp to squeeze one tooth at the time.**



Finger Punch

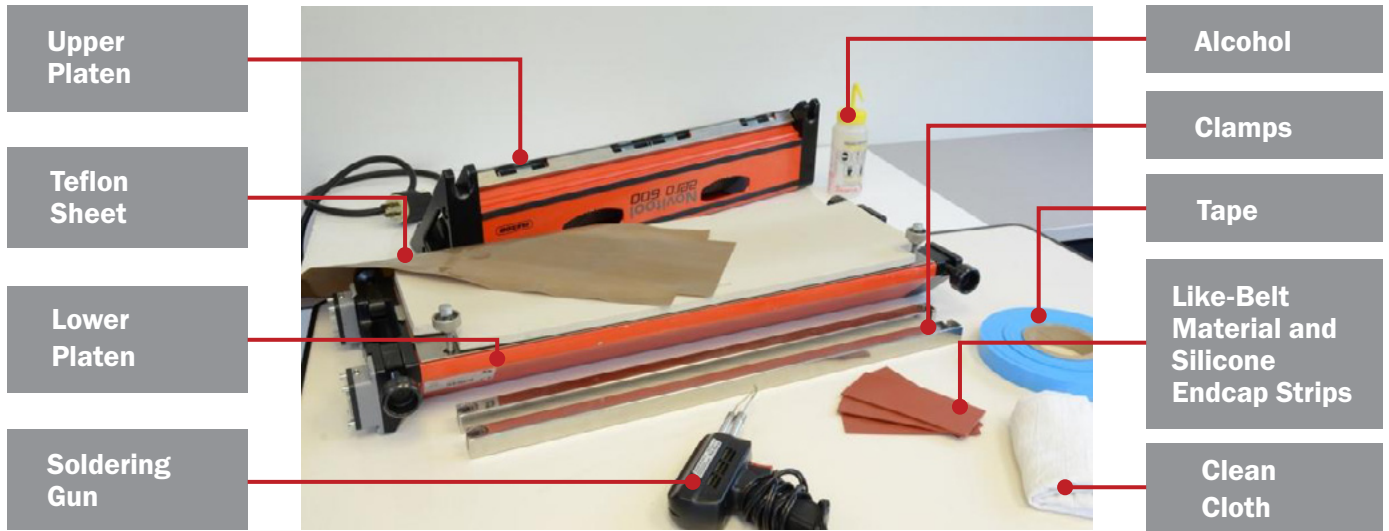
**B. Using a flat head screw driver, pry the blade out of the cutting fixture.**

**C. If the blade does not cut through the belt, use a nylon or rubber hammer to complete the cut. Use light hammer pressure.**

4. The “AA” end of the belt will be inserted from the back of the cutting fixture and punched from the front of the cutting fixture. The “BB” end of the belt needs to be punched from the back of the cutting fixture but inserted from the front of the fixture. Both cuts will match each other. In this procedure the cutting fixture remains the same but the welding clamp will go from the back of the fixture.



## PRESS ASSEMBLY – CC40



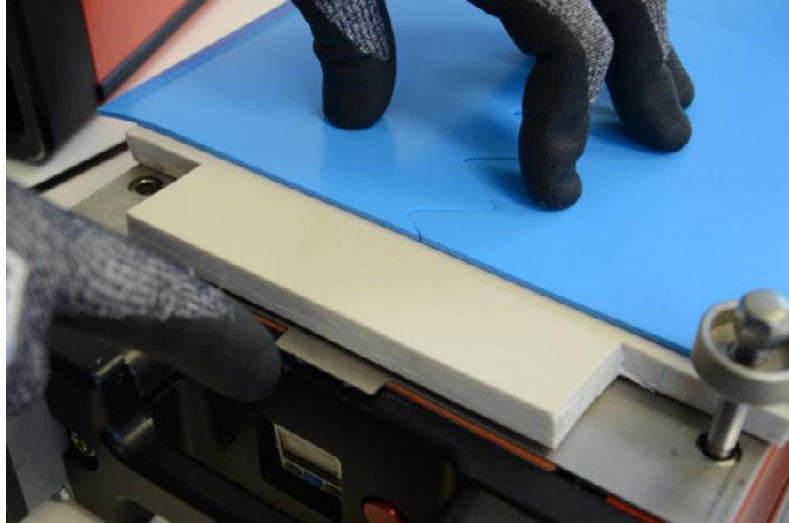
Welder and Accessories

1. Once both ends are cut/punched, place one end of the belt into the press.



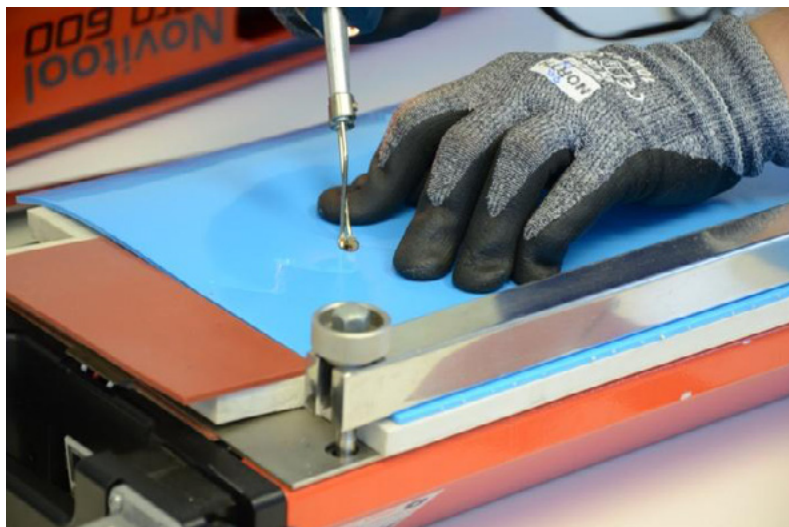


2. Place the other belt end in the press and align the belts.



3. Use the soldering gun to tack the cut in place. Add filler strips of like-material against the belt edges, place a narrow strip (at least .015" (0.381 mm) thinner than the belt) on each side outside to cap the end of this belt-like material.

- Filler strips along the belt edges serve several purposes:
  - Prevents the belt material from flowing out during the welding process
  - Helps avoid a “necking down” appearance caused by belt width shrinkage
  - Helps balance the top press beam during welding
- There can be no gaps or open areas on the platen bed



Tack Weld with Soldering Gun

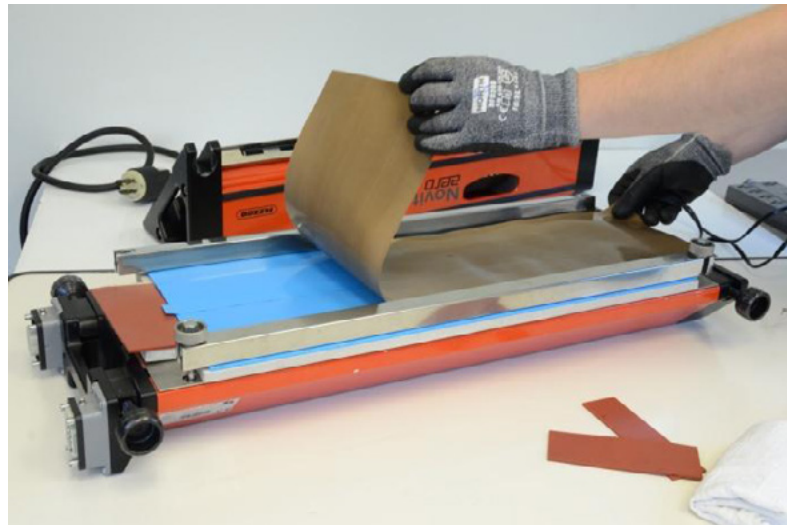


4. Apply a 1.5” (38.1 mm) strip of blue urethane foil across the belt over the top and bottom splice (Gates TPU PN 15260, sold in 50’ lengths).



Tape Positioned Over Belt Joint

5. Place Teflon sheet over the joint area. Be careful to keep it aligned with the welding area.



Add Teflon Sheet



6. Set the top of the welder on the Teflon sheet.



Position Welder Top

7. Hand-tighten the side bolts until they stop.

- Do NOT use any tools to tighten the bolts. Tighten bolts by hand only



Hand Tighten Side Bolts

## WELDER OPERATION – CC40

### 1. To start the welder power.

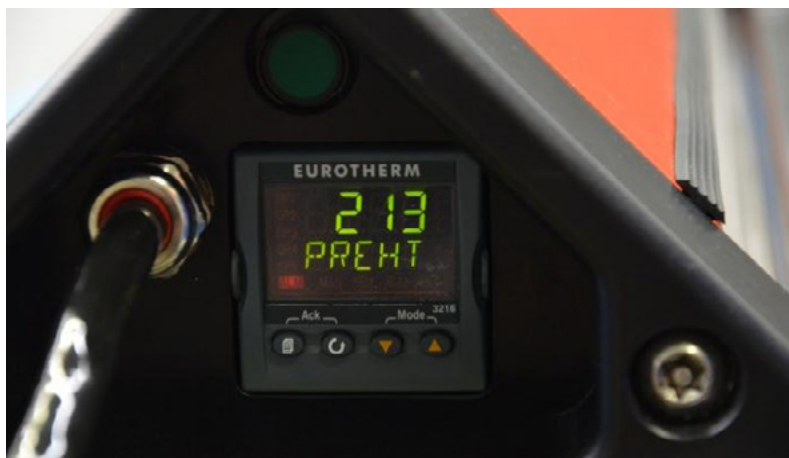
- A. Connect cable from the top of the welder into the bottom press beam and then plug it into the power cord (Voltage from 230V to 460V).
- B. Powered on, the welder will be idling at ~70°F (21°C).



Powered On, Idling

### 2. Temperature control.

- A. Press the first, left, button to switch to level 2 to control the bottom platen separately and it will switch back automatically to idling mode.



Preheat Mode



- B. Pre-dry option** – If the working environment is humid or wet, it will be necessary pre-dry the belt. Failure to do so will cause pinholes created by the steam escaping from the belt during welding. The pre-dry temperature and time must be set manually. No pressure is used in the press during the pre-dry cycle. The pre-dry setting is 200°F (93.3°C) for five to ten minutes.
- C. The actual belt temperature will vary due to the individual press, the belt material and the environment.** Prior to attempting the actual weld, it is necessary to confirm that the temperature needed to achieve this phase transition is met by conducting a test weld. To conduct this test, a thermocouple must be embedded in the belt material. Minimum actual belt temperature and dwell time can be found directly below the Weld Parameters table. If the thermocouple doesn't register this minimum actual belt temperature, it is likely that the weld will be compromised. It will be necessary to contact Flexco to determine the root cause of the problem.
- D. The settings below are recommended starting points only.** Note that final belt temperature is influenced by the material, the environment and the Aero press itself.

## WELDING PARAMETERS

For use with the 12 mm thick silicone bottom plate

		CC40
Top Platen	Degrees F (C)	365°F (185°C)
Bottom Platen	Degrees F (C)	+5%
Cycle Time	Minutes	7 1/2
Pressure	Bar	1.98
Type of Cut	-	Finger
Bottom Pad (12. mm)	-	Silicone

For use with the 10 mm thick silicone bottom plate

		CC40
Top Platen	Degrees F (C)	365°F (185°C)
Bottom Platen	Degrees F (C)	365°F (185°C)
Cycle Time	Minutes	7 1/2
Pressure	Bar	1.98
Type of Cut	-	Finger
Bottom Pad (10 mm)	-	Silicone

Minimum Actual Belt Readings (for use with other platen press types)

		CC40
Temperature	Degrees F (C)	360°F (182.2°C)
Dwell Time	Minutes	3

3. Remove the clamps completely before starting the weld cycle. Push the start button on the top platen above the digital screen twice (green button).

A. All temperature control options must be completed.



Preheat Mode

4. Cooling and removing the belt. When the welder completes the welding and cooling processes:

A. Release the pressure using the RED button on the bottom next to pressure regulator digital screen.

B. Loosen the side bolts.

C. Remove the top of the welder.

D. Check the joint weld area.



Release Pressure Using the RED Button

5. **IMPORTANT:** Do NOT run the belt immediately. The belt requires an additional 30 to 60 minutes cooling time.





## BELT PREPARATION – FC9 AND FC12

### FINGER CUT DIRECTIONS

1. Flat belt should be prepared following a traditional flat belt finger pattern such as 0.78”x 2.75” (20 mm x 70 mm). In the event that a finger cannot be punched, the belt preparation process described in CC40 section can be used.

### PRESS ASSEMBLY – FC9 AND FC12

1. Place Teflon sheet.



Add Teflon Sheet



2. Place one end of the belt into the press.



Belt on Press

3. Load the other end of the belt into the press from the opposite side.



Second Belt Half on Press



4. Tack the belt with soldering gun.



Tack with Soldering Gun

5. Fill out the balance of the platen with like-belt material and use a narrow silicone strip (approximately 1" wide and at least 0.015" (0.381 mm) thinner than the belt itself) at each outside platen end to cap the end of this like-belt material. Silicone can be substituted to fill out the press but the use of like belt material will reduce the "hourglass" effect in the weld area caused by shrinkage.



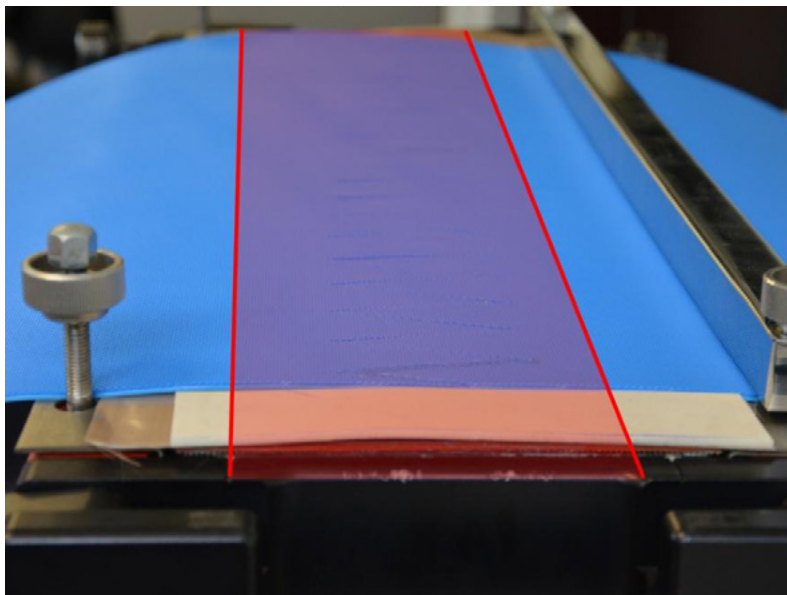
Filler Strips Added



- Filler strips along the belt edges serve several purposes
  - Prevent the belt from flowing out during the welding process
  - Help minimize shrinkage in the weld area
  - Balance the top and bottom platen during welding
- There can be no gaps or open areas on the platen bed

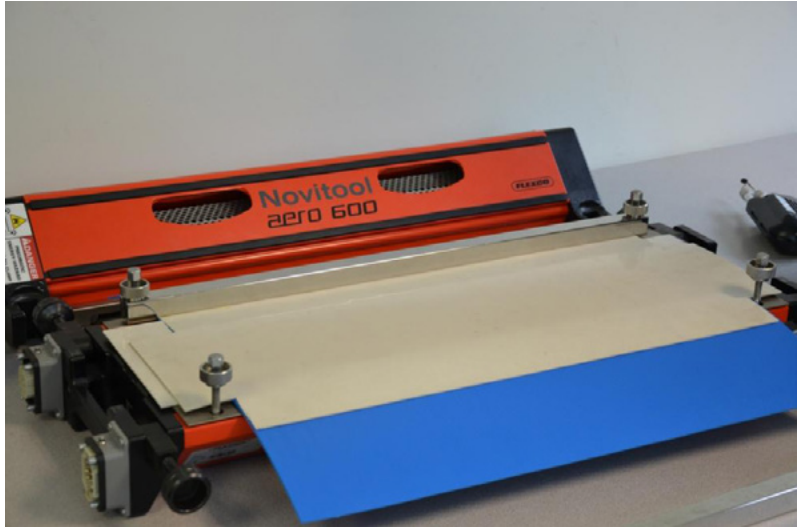
Add 1.5" (38.1 mm) foil over splice (Gates TPU PN 15260, sold in 50' (15.24 m) lengths)

6. The effective heating area is indicated by two notches on the black frame of the press approximately five inches apart. Be sure that the area to be welded is within this melt zone. If the tips of the fingers were to slide outside this melt zone area during the setup, this area would not get the heat necessary for a proper weld.





7. Place silicone pad over embossed side.



Pad Added

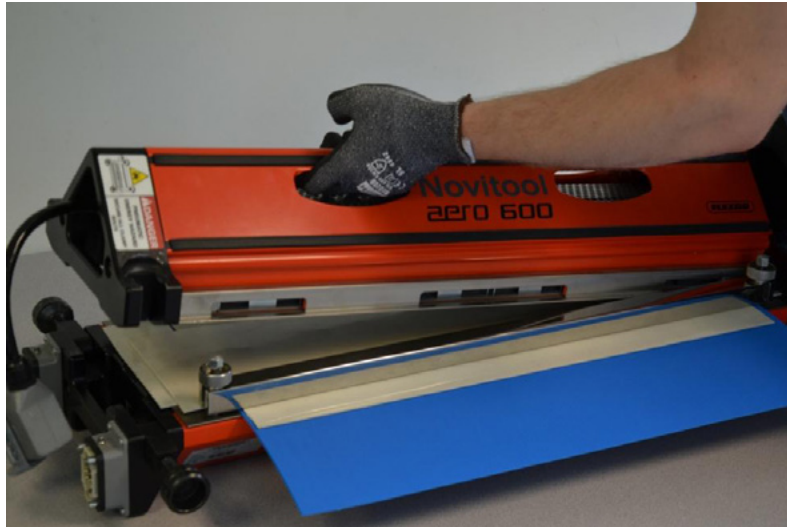
8. Install clamping bars.



Position Clamping Bars



9. Set the top platen on the pad.



Position Welder Top

10. Hand-tighten the side bolts until they stop.

- Do NOT use any tools to tighten the bolts. Tighten bolts by hand only.



Hand Tighten Side Bolts

## WELDER OPERATION – FC9 AND FC12

### 1. To power the welder.

A. Connect cable from the top of the welder into the bottom platen and then plug it into the power cord (Voltage from 230V to 460V).

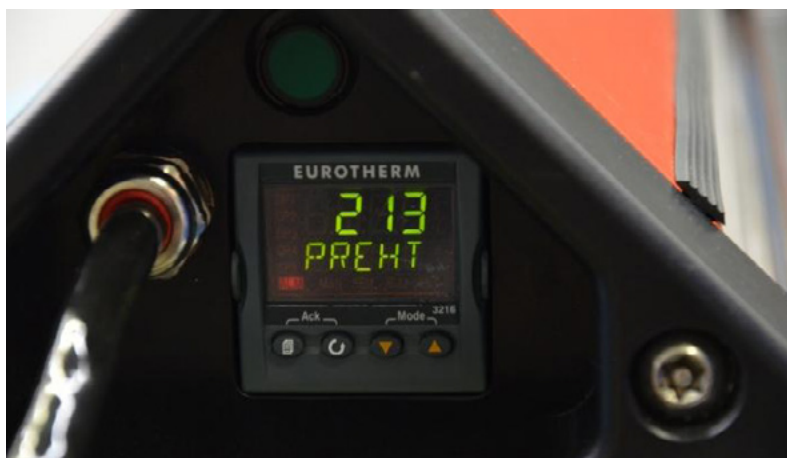
1) Powered on, the welder will be idling at ~70°F (21°C).



Powered On, Idling

### 2. Temperature control.

A. Press the first, left, button to switch to level 2 to control the bottom platen separately and it will switch back automatically to idling mode.



Preheat Mode



- B. Pre-dry option** – If the working environment is humid or wet, pre-dry the belt. Failure to do so will cause pinholes created by the steam escaping from the belt during welding. The pre-dry temperature and time must be set manually. No pressure is used in the press during the pre-dry cycle. The pre-dry setting is 200°F (93.3°C) for five to ten minutes.
- C. The actual belt temperature will vary due to the individual press, the belt material and the environment.** Prior to attempting the actual weld, it is necessary to confirm that the temperature needed to achieve this phase transition is met by conducting a test weld. To conduct this test, a thermocouple must be embedded in the belt material. The minimum actual belt temperature as measured by your own thermocouple placed between the silicone pad and the belt itself can be found directly below the Weld Parameters table.
- D. The settings below are recommended starting points only.** Note that final belt temperature is influenced by the material, the environment and the Aero press itself.

## WELDING PARAMETERS

		FC9	FC12
Top Platen	Degrees F (C)	360°F (182.2°C)	360°F (182.2°C)
Bottom Platen	Degrees F (C)	360°F (182.2°C) (+0%)	360°F (182.2°C) (+0%)
Cycle Time	Minutes	7 1/2	7 1/2
Pressure	Bar	1.98	1.98
Type of Cut		Finger	Finger
Pad	Smooth	Teflon	Teflon
-	Embossed	Silicone	Silicone

## MINIMUM ACTUAL BELT READINGS

		FC9	FC12
Temperature	Degrees F (C)	360°F (182.2°C)	360°F (182.2°C)
Dwell Time	Minutes	3	3



3. Before starting the weld cycle, remove the clamping bars completely from the press. Push the start button twice on the top platen above the digital screen (green button) to start the cycle.

A. All temperature control options must be complete.



Green Start Button

4. Cooling and removing the belt. Maximum temperature before opening the press is 150°F (65.5°C). When the welder completes the welding and cooling cycles:

A. Release the pressure using the RED button on the bottom next to pressure regulator digital screen.



Release Pressure Using the RED Button

- B. Loosen the side bolts.  
 C. Remove the top platen.  
 D. Check the joint weld area for good flow.

5. **IMPORTANT:** Do NOT run the belt immediately. The belt requires an additional 30 to 60 minutes cooling time.



## TROUBLESHOOTING

PROBLEM	SOLUTION
Unit will not turn on	Check power supply
Unit turned off on own	Thermostat safety switch may have determined that the press had overheated. Be sure that the platen is fully loaded with material as an opening above the thermostat will cause the temperature in that area to climb above that recommended for the press
Unit makes a clicking sound when turned on	Extension cord used may be exceeding the maximum cord length of 100'
Weld shows pinholing or pockmarking	Marking caused by excessive water in belt. Run a pre-dry cycle to drive moisture from belt
Platen temperature not reaching set temperature	Be sure extension cord length is no greater than 50"
Bolts wear out	Need to change out both the bolt and the threaded blocks. (sold in pairs)
Belt edge lift	Shrinkage in the weld area will cause some edge lift. This can be minimized by not overcooking the belt



# TPU BELTS

THERMOPLASTIC POLYURETHANE

#### **NORTH AMERICA**

Gates TPU  
9 Northwestern Drive  
Salem, NH 03079  
Tel. +1 (800) 394-4844  
Email: [contact@gates.com](mailto:contact@gates.com)

#### **EMEA**

Gates TPU GmbH  
Werner von Siemens Strasse 2  
64319 Pfungstadt, Germany  
Tel. +49 (0) 6157-9727-0  
Email: [sales-pfungstadt@gates.com](mailto:sales-pfungstadt@gates.com)

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